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CONTENTS

Low level technology tool (LLTT) in screening for blindness: test qualities in the outpatients department of a tertiary eye unit using the Snellen chart.

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Abstract

Objective: To validate the use of finger counting (low level technology tool) in screening for blindness in the outpatients department of a tertiary eye unit with the view of employing the test for screening illiterate people in hard to reach parts of the country where the conventional visual acuity charts are not available.
Design: A performance evaluation of counting fingers (LLTT) in screening for blindness against the standard test (Snellen Chart).
Setting: Sekuru Kaguvi Eye Unit, Parirenyatwa Hospital, Zimbabwe.
Subjects: Patients presenting to the Eye Outpatient Department at Sekuru Kaguvi Eye Unit with various eye problems.
Main Outcome Measure: Sensitivity of low level technology tool (LLTT) in identifying blind people.

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Results: Sensitivity and specificity of LLTT in detecting blindness in all age groups combined was 100% and 88.5% respectively. Although sensitivity was not affected by patient age, specificity decreased with increasing age. The overall positive predictive value for the test was 53.3% and the prevalence of blindness among outpatient attendees was 11.6%.

Conclusion: Finger counting is an effective tool that can be employed in screening for blindness in communities which are hard to reach, have low literacy rate and when conventional methods of testing visual acuity are not available.

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Introduction

Visual acuity is a measure of form sense which depends on the resolving power of the eye and light sense. The Snellen chart had been the universally accepted "gold standard" method used to measure visual acuity until the introduction of the crowded logMAR acuity test.[1] Illiteracy, the cost of making the charts and the need for some basic training of the user are some of the limitations associated with the instrument when employed to screen for blindness in communities which are hard to reach. The need for a reliable, cheap, readily available and universally accepted alternative instrument for screening people with visual problems in remote places cannot be underscored especially today when there is a global fight against avoidable blindness through "Vision 2020" programmes. Locals can use this tool to identify those with visual impairment and arrange for them to be seen by the ophthalmic team for proper assessment.

Alternatives instruments to the Snellen Chart employed to screen for blindness in communities in the past were not validated. In Iceland a blind person was identified during the census as one who was either totally blind or could not find one's way in unfamiliar places because of poor sight.[2] A survey on disabling conditions conducted in Thailand defined visual disability as inability to count fingers at three meters distance.[3] In 1959 a survey conducted in Southern Rhodesia (Zimbabwe) defined a blind person as one who had to be led.[4]

Work done by Hiller and Krueger in 1983 when they validated the use of a single survey question to measure visual acuity impairment underscores the need for determining the sensitivity and specificity of screening tools.[5] Their study showed that a single survey question had a very low sensitivity ranging from 15.6% to 47.7% and a high specificity ranging from 82.5% to 89.9%.

The aim of the study was to assess the sensitivity of finger counting referred to as low level technology tool (LLTT) in screening for blindness in the community.

Materials and Methods

All study subjects were selected from a population of eye outpatient clinic attendees at Sekuru Kaguvi Eye Unit using systematic random sampling. Study subjects were seven years of age and older and each subject could at least read the alphabet. Illiterate patients, these mentally retarded, the deaf and dumb patients were excluded from the study. All study subjects had their visual acuity tested using the Snellen chart and finger counting (LLTT) separately by two pre-trained nurses who were masked to each other's results. Visual acuity measured by the Snellen Chart was assessed in the usual manner with the chart held six metres away from the patient in a well light room. Visual function for each eye was tested separately and recorded. For the LLTT, a patient was asked to count fingers shown from an outstretched hand held at the same distance of six metres. The distance was progressively reduced by a metre in both cases when the patient failed to read the biggest letter on the Snellen chart or count fingers.

Visual acuity was assessed unaided in most cases or with available correction. Visual acuity by LLTT was defined as identification of at least two out of three fingers (index, middle and fourth fingers) shown at a specified distance without difficult. Snellen acuity was defined as ability to recognise the top letter at six metres distance for 6/60 vision or less. The patient was allowed to miss out one letter only per line for vision better than 6/60. Illumination was similar (artificial overhead lighting) for the two testing conditions.

Data on gender, age and ocular disease were recorded for each study subject in addition to visual acuity. The data was entered into the computer using an epidemiological information package (Epi Info version 6) and then transferred to a statistical package STATA using STAT transfer programme for analysis.

Statistical Analysis: Univariate analysis were done for all the variables. Analysis of sensitivity, specificity, and predictive values were done by use of the standard formulae for these test qualities.[6] The test qualities were stratified by age group to assess the trend of test qualities. All the tests were controlled for their group prevalence.

Results

A total of 963 subjects had their visual acuity tested by the two instruments. Forty six percent of the subjects were males and 54% females. The median age was 40 years (interquartile range of 25, 60). There was no significant difference between performance results of the two eyes (left versus right). Thus results of the right eye are presented in this paper.

Table I: Distribution of sensitivity, specificity, predictive values and prevalence of blindness by age group.

Age group	Sample size	Sensitivity	Specificity	+Predictive	Prevalence
7-10	63	100%	96.6%	66.7%	6.3%
11-20	98	100%	89.4%	28.6%	4.1%
21-30	183	100%	97.1%	70.6%	6.6%
31-40	137	100%	93.7%	55.6%	7.3%
41-50	93	100%	91.6%	58.8%	10.8%
51.60	143	100%	87.1%	54.3%	13.3%
61-70	154	100%	76.8%	50%	18.8%
71-80	72	100%	72.2%	54.5%	25%
81-90	12	100%	42.9%	55.6%	41.7%
All ages	**955**	**100%**	**88.5%**	**53.3%**	**11.6%**

Eight subjects did not have their ages specified on the questionnaire and, therefore, were excluded from the analysis. The sensitivity of the LLTT in detecting blindness (blindness being defined here as visual acuity of less than 3/60 by Snellen chart) of counting fingers at less than three metres away was 100% for all age groups. This was not affected by increasing age or prevalence of blindness as seen with specificity and positive predictive value. A probable explanation for the high sensitivity value could be that LLTT was identifying patients with Snellen acuity of less than 3/60. Specificity showed a decreasing trend with increasing age group.

The test efficiency for the LLTT was found to be high (89.8%) and the overall specificity was 88.5% with a 95% C/I of (86.5%, 90.5%).

Discussion

In industrialized countries the Snellen chart is the basis for screening for blindness and detection of subnormal vision. Although this method has been in use since the first half of the 20th century, it has limitations in communities where the literacy level and socio-economic status are very low. The performance of LLTT in terms of sensitivity remained constantly high irrespective of the age group, indicating its acceptability in the communities with low resources and limited ophthalmic technology. Thus where large scale visual acuity screening using the Snellen chart is not available consistently, LLTT could be a readily available and a potentially sustainable tool which, if coupled with effective treatment, could reduce the burden of blindness in developing countries. The instrument can be employed where Snellen charts are not available as a cheap, cost effective method of rapidly differentiating between potentially blind people and those with mild to moderate visual impairment. This instrument can be used during census enumeration to determine the national burden of visual impairment.

Recommendation: LLTT is a reliable alternative to Snellen chart in terms of detecting blindness in hard to reach communities found in developing countries where illiteracy is rampant. It can be employed by census enumerators to assess the magnitude of blindness at national level, cataract finders and members of the public when deciding when to take someone for cataract surgery as part of Vision 2020 campaign strategies.

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